New England Common Assessment Program

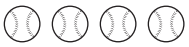
Released Items 2007

Grade 8 Mathematics

Mathematics

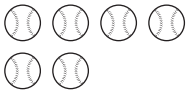
Item selected from Session One—no calculators or other mathematics tools allowed.

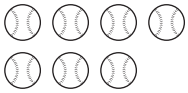
1 The diagram below represents the number of baseball games the Jays won last year.

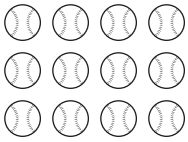


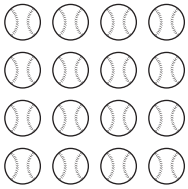
Games Won Last Year

This year the Jays won 300% of the number of games they won last year. Which diagram represents the number of games the Jays won this year?

A. 

B. 

C. 

D. 

2 This chart shows the percent of students who are girls in each of Crystal's four classes.

Class	Total Number of Students (Girls and Boys)	Percent Who Are Girls
Science	18	50%
Math	20	50%
Reading	20	25%
Social Studies	30	30%

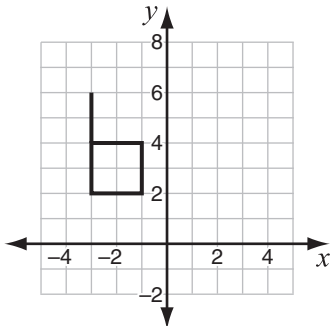
Which two classes have the same number of girls?

A. science and math
B. math and reading
C. science and social studies
D. math and social studies

3 Jason buys sports equipment worth $80.00 and pays 5% sales tax. What is the total amount Jason pays, including sales tax, for the sports equipment?

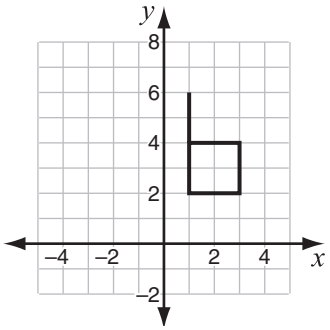
A. $88.00
B. $85.00
C. $84.00
D. $82.50

4 Look at this figure on the grid.



Which grid shows the image of the figure after it is reflected over the y-axis?

A.



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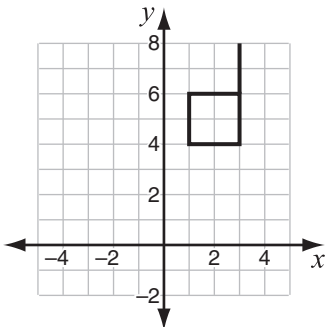
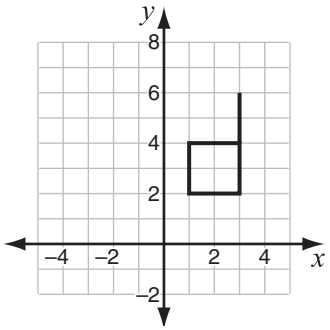
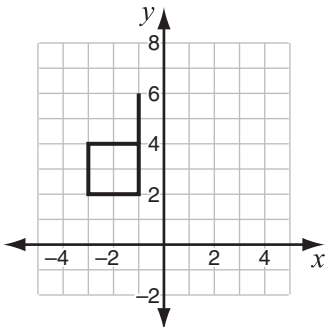


C.



D.



5 Students in Mrs. Munson's mathematics class measured the outside temperature each day for 4 days. They recorded their measurements in tables. Which table shows a **varying rate** of change in the temperature?

A.

Monday

Time	Temperature (°F)
9:00	45
9:15	47
9:30	49
9:45	51
10:00	53

B.

Tuesday

Time	Temperature (°F)
9:00	50
9:15	52
9:30	53
9:45	55
10:00	56

C.

Wednesday

Time	Temperature (°F)
9:00	60
9:15	60
9:30	60
9:45	60
10:00	60

D.

Thursday

Time	Temperature (°F)
9:00	60
9:15	59
9:30	58
9:45	57
10:00	56

6 What is the value of $\frac{2}{3}x - \frac{1}{2}$ when $x = 18$?

A. 3

B. 6

C. $11\frac{1}{2}$

D. $26\frac{1}{2}$

7 While bird watching, Mary saw two robins for every three cardinals. If n represents the number of robins, which expression represents the number of cardinals she saw?

A. $2n+3$

B. $3(2n)$

C. $\frac{n}{2}+3$

D. $\frac{3n}{2}$

8 Four people have dinner together at a restaurant. They pay equal portions of the cost, in dollars, of the dinner, d, and the \$10 tip. Which expression represents the amount of money each person pays?

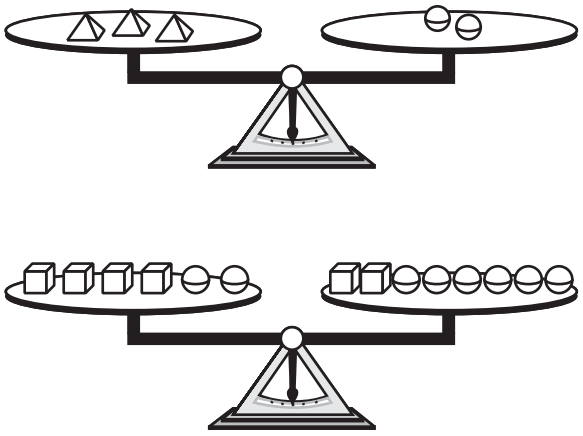
A. $d \div 4 + 10$

B. $4 \div (d + 10)$

C. $d + 10 \div 4$

D. $(d + 10) \div 4$

9 These scales are balanced.



How many △ weigh the same as one □?

A. $\frac{2}{3}$

B. $1\frac{1}{2}$

C. 2

D. 3

10 The table below shows how blood types are distributed in the American population.

Blood Type	Percent of Population
O	43%
A	40%
B	12%
AB	5%

Which type of graph **best** displays the data in the table?

A. circle graph

B. line graph

C. histogram

D. scatter plot

11 Write two numbers so that

- the first number is **less than** the second number, and
- the absolute value of the first number is **greater than** the absolute value of the second number.

12 The sum of the measures of the interior angles of a regular polygon is 540°. How many sides does the polygon have?

13 Morgan and Ted each earn \$8 per hour. Today Ted started work $\frac{1}{2}$ hour after Morgan. They stopped working at the same time.

a. Write an algebraic expression that shows how much money Morgan earned for the number of hours, m, she worked.

b. Write an algebraic expression that shows how much money Ted made in terms of m, the number of hours Morgan worked.

14 The table below shows scores on a mathematics placement exam reported from five different schools.

Mathematics Scores

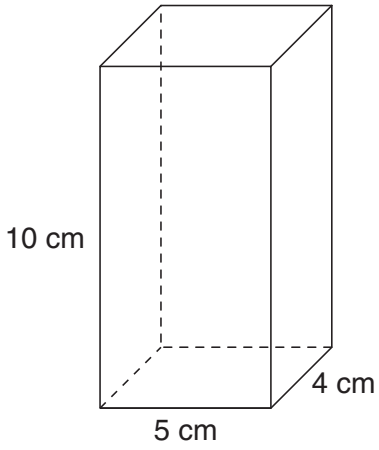
School	Score
Bayview Middle School	35.4
Mountain Top Middle School	30.9
Sunset Middle School	26.1
Evergreen Middle School	30.3
Gateway Middle School	31.3

Based on these data, the mean school score is 30.8. An error was found in the Sunset Middle School score. The correct score is:

Sunset Middle School	Correct score: 29.6

What is the corrected mean school score? Show your work or explain how you know.

15 This diagram shows the dimensions of a container in the shape of a rectangular prism.



a. What is the volume, in cubic centimeters, of the container? Show your work or explain how you know.

b. A different container is also a rectangular prism and has the same volume as the container in part a. This container has a square base with side lengths of 5 cm. What is the height, in centimeters, of this container? Show your work or explain how you know.

Grade 8 Mathematics Released Item Information

Released Item Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No Tools Allowed		✓	✓			✓					✓		✓		
Content Strand[1]	NO	NO	NO	GM	FA	FA	FA	FA	FA	DP	NO	GM	FA	DP	GM
GLE Code	7-1	7-1	7-4	7-4	7-2	7-3	7-3	7-4	7-4	7-3	7-2	7-2	7-3	7-2	7-6
Depth of Knowledge Code	1	2	1	1	2	1	3	2	2	2	3	2	2	3	2
Item Type[2]	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	SA	SA	SA	SA	CR
Answer Key	C	C	C	C	B	C	D	D	D	A					
Total Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4

[1]Content Strand: NO = Numbers & Operations, GM = Geometry & Measurement, FA = Functions & Algebra, DP = Data, Statistics, & Probability

[2]Item Type: MC = Multiple Choice, SA = Short Answer, CR = Constructed Response

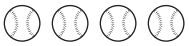
New England Common Assessment Program

Released Items Support Materials 2007

Grade 8 Mathematics

N&O 7.1 **Demonstrates conceptual understanding of rational numbers with respect to percents** as a means of comparing the same or different parts of the whole when the wholes vary in magnitude (e.g., 8 girls in a classroom of 16 students compared to 8 girls in a classroom of 20 students, or 20% of 400 compared to 50% of 100); and percents as a way of expressing multiples of a number (e.g., 200% of 50) **using models, explanations, or other representations**.

1 The diagram below represents the number of baseball games the Jays won last year.



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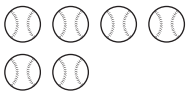
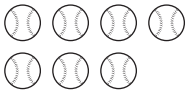
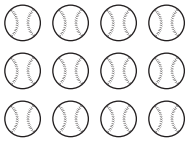
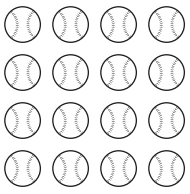
A. 

B. 

C. 

D. 

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2 This chart shows the percent of students who are girls in each of Crystal's four classes.

Class	Total Number of Students (Girls and Boys)	Percent Who Are Girls
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Which two classes have the same number of girls?

A. science and math
B. math and reading
C. science and social studies
D. math and social studies

N&O 7.4 **Accurately solves problems involving** proportional reasoning; percents involving discounts, tax, or tips; and rates. (IMPORTANT: *Applies the conventions of order of operations including parentheses, brackets, or exponents.*)

3 Jason buys sports equipment worth $80.00 and pays 5% sales tax. What is the total amount Jason pays, including sales tax, for the sports equipment?

A. $88.00

B. $85.00

C. $84.00

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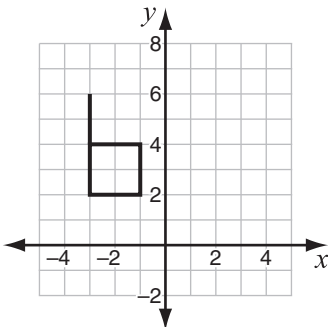
G&M 7.4 **Applies the concepts of congruency** by solving problems on a coordinate plane involving reflections, translations, or rotations.

4 Look at this figure on the grid.



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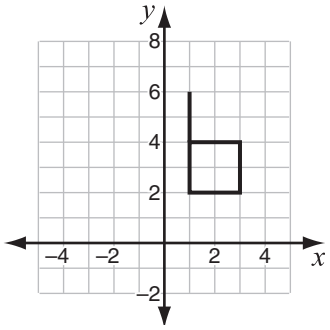

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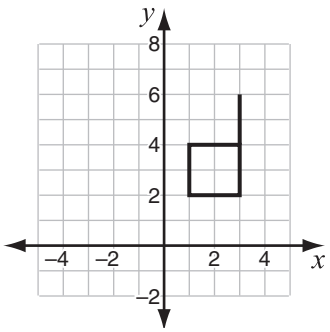

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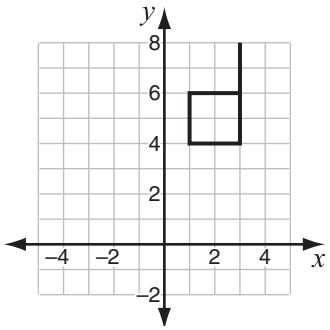
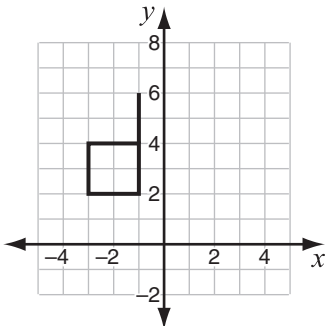


D.



F&A 7.2 **Demonstrates conceptual understanding of linear relationships** ($y = kx$; $y = mx + b$) **as a constant rate of change** by solving problems involving the relationship between slope and rate of change, by describing the meaning of slope in concrete situations, or informally determining the slope of a line from a table or graph; **and distinguishes between constant and varying rates** of change in concrete situations represented in tables or graphs; **or describes how change in the value of one variable relates to change in the value of a second variable** in problem situations with constant rates of change.

5 Students in Mrs. Munson's mathematics class measured the outside temperature each day for 4 days. They recorded their measurements in tables. Which table shows a **varying rate** of change in the temperature?

A.

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Time	Temperature (°F)
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F&A 7.3 **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 5x^3 - 2$).

6 What is the value of $\frac{2}{3}x - \frac{1}{2}$ when $x = 18$?

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A. $2n + 3$

B. $3(2n)$

C. $\frac{n}{2} + 3$

D. $\frac{3n}{2}$

F&A 7.4 **Demonstrates conceptual understanding of equality** by showing equivalence between two expressions (expressions consistent with the parameters of the left- and right-hand sides of the equations being solved at this grade level) using models or different representations of the expressions, solving multi-step linear equations of the form $ax \pm b = c$ with $a \neq 0$, $ax \pm b = cx \pm d$ with $a, c \neq 0$, and $(x/a) \pm b = c$ with $a \neq 0$, where a, b, c and d are whole numbers; or by translating a problem-solving situation into an equation consistent with the parameters of the type of equations being solved for this grade level.

8 Four people have dinner together at a restaurant. They pay equal portions of the cost, in dollars, of the dinner, d, and the $10 tip. Which expression represents the amount of money each person pays?

A. $d \div 4 + 10$

B. $4 \div (d + 10)$

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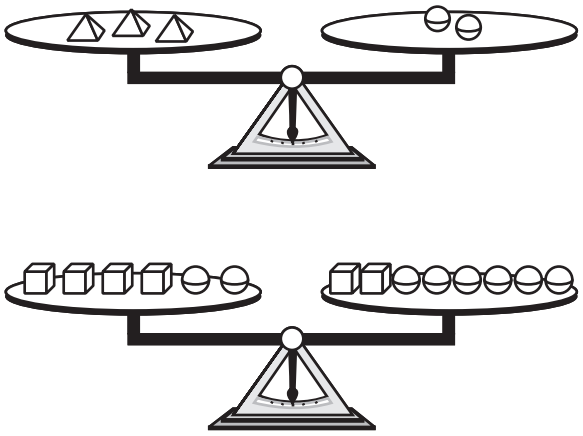


How many △ weigh the same as one □?

A. $\frac{2}{3}$

B. $1\frac{1}{2}$

C. 2

D. 3

DSP 7.3 **Identifies or describes representations or elements of representations that best display a given set of data or situation**, consistent with the representations required in M(DSP)–7–1.

10 The table below shows how blood types are distributed in the American population.

Blood Type	Percent of Population
O	43%
A	40%
B	12%
AB	5%

Which type of graph **best** displays the data in the table?

A. circle graph
B. line graph
C. histogram
D. scatter plot

N&O 7.2 **Demonstrates understanding of the relative magnitude of numbers** by ordering, comparing, or identifying equivalent rational numbers across number formats, numbers with whole number bases and whole number exponents (e.g., 3^3, 4^3), integers, absolute values, or numbers represented in scientific notation using number lines or equality and inequality symbols.

11 Write two numbers so that

- the first number is **less than** the second number, and
- the absolute value of the first number is **greater than** the absolute value of the second number.

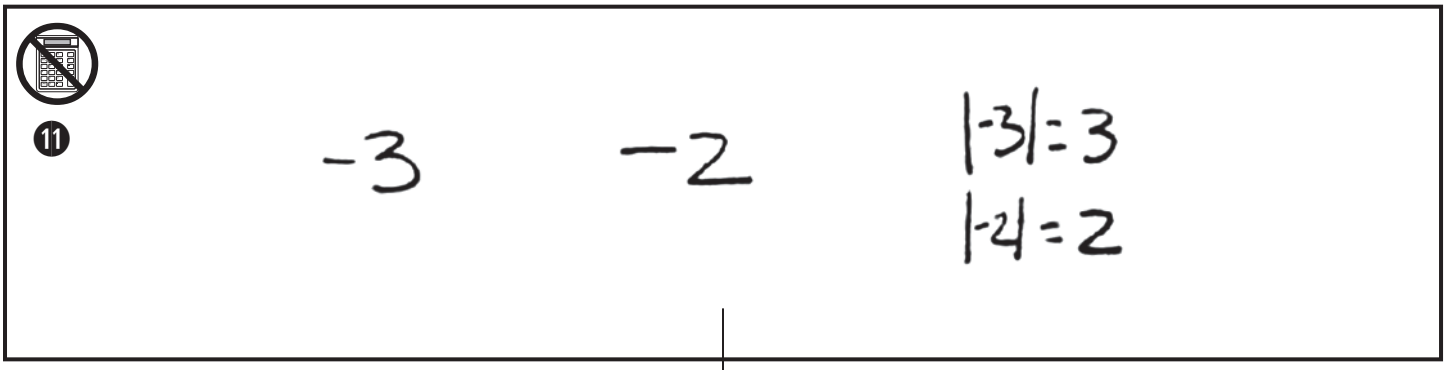
Scoring Guide

Score	Description
1	Student gives a correct response.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Training Notes:

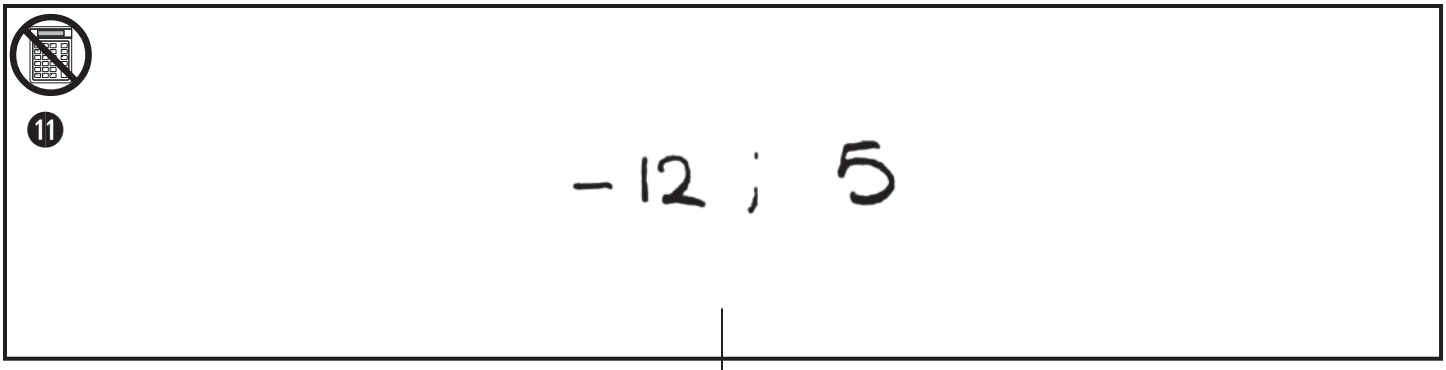
Answers will vary, but must have the following properties: one number must be negative with the other number having a lesser absolute value than the first number, e.g., $-7 < 3$ and $|-7| > 3$.

Score Point 1
(Example A)



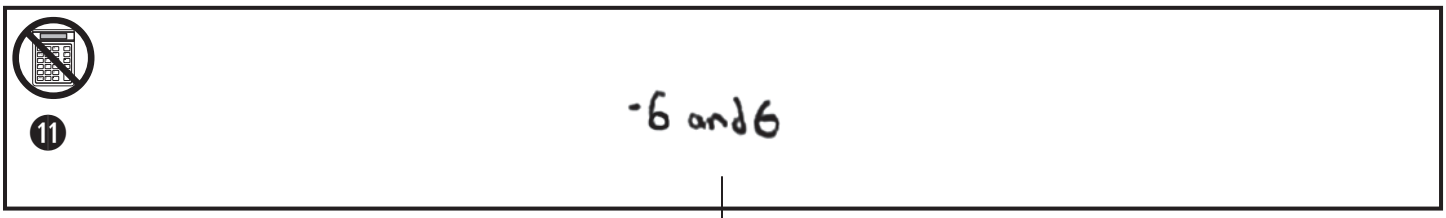
Student's response is correct.
(Showing work is not required.)

Score Point 1
(Example B)



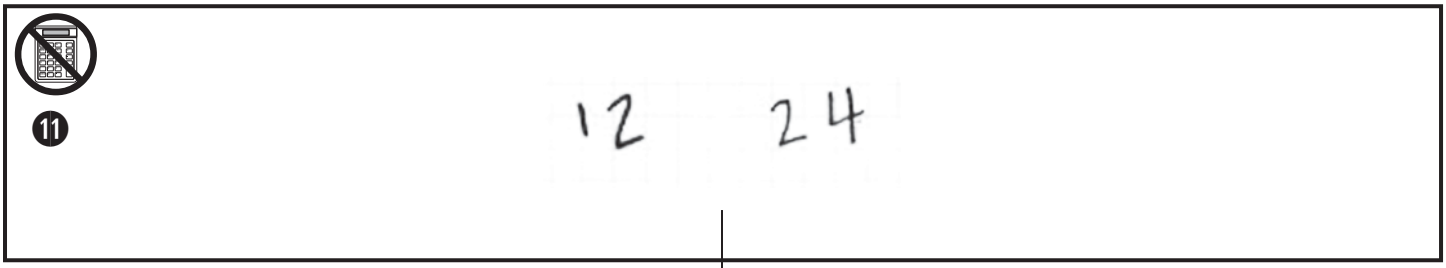
Student's response is correct.

Score Point 0
(Example A)



Student's response is incorrect.

Score Point 0
(Example B)



Student's response is incorrect.

G&M 7.2 **Applies theorems or relationships** (triangle inequality or sum of the measures of interior angles of regular polygons) to solve problems.

12 The sum of the measures of the interior angles of a regular polygon is 540°. How many sides does the polygon have?

Scoring Guide

Score	Description
1	Student gives the correct answer, **5**.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Score Point 1
(Example A)

12

5 Sides

Student's answer is correct.

Score Point 1
(Example B)

12

$^{2}180 \times 3 = 540^\circ$

The pollygon has 5 sides

Student's answer is correct.
(Showing work is not required.)

Score Point 0
(Example A)

12

540

$6\overline{)540}$ = 90
54

(6)

Student's answer is incorrect.

Score Point 0
(Example B)

12

540° ÷ 180° = 3
The polygon would have 3 angels because there is 180° angle. 540 ÷ 180 = 3 .

Student's answer is incorrect.

F&A 7.3 **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 5x^3 - 2$).

13 Morgan and Ted each earn \$8 per hour. Today Ted started work $\frac{1}{2}$ hour after Morgan. They stopped working at the same time.

a. Write an algebraic expression that shows how much money Morgan earned for the number of hours, m, she worked.

b. Write an algebraic expression that shows how much money Ted made in terms of m, the number of hours Morgan worked.

Scoring Guide

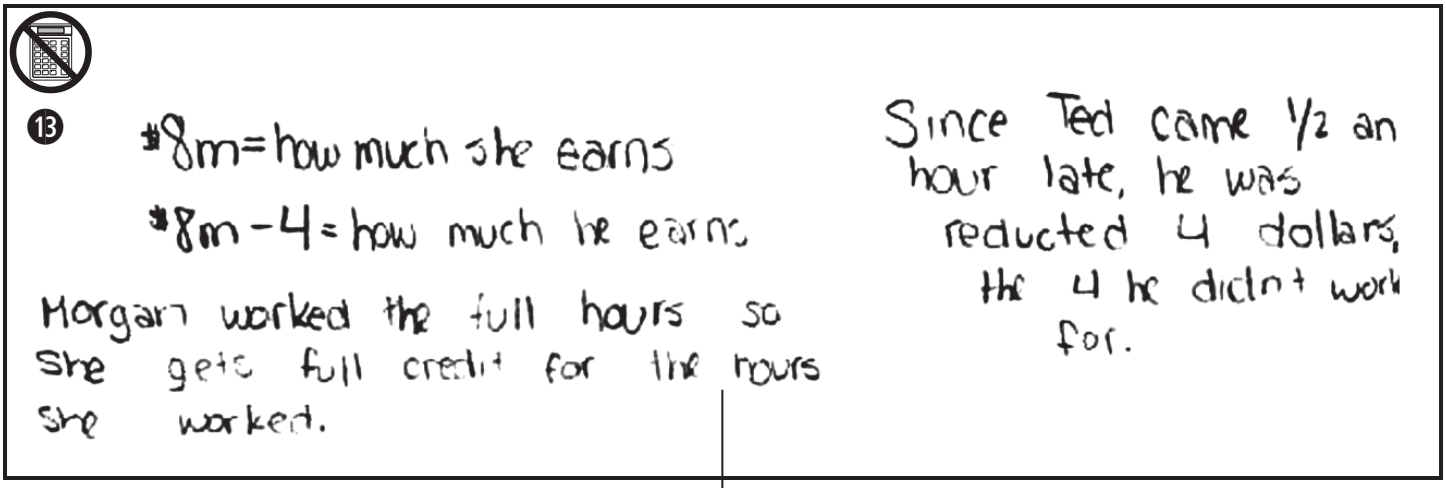
Score	Description
2	Student gives correct answers for both parts.
1	Student gives correct answer for one part.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Responses:

Part a: $8m$

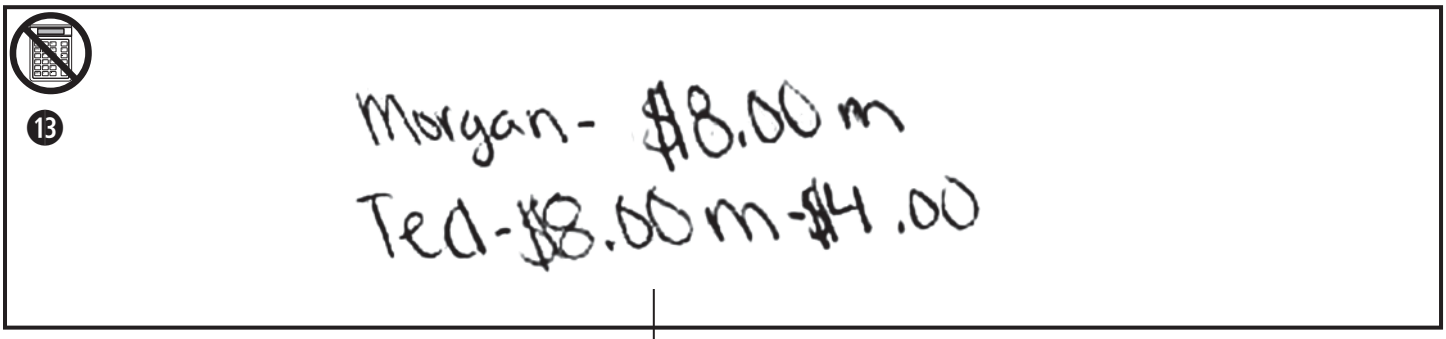
Part b: $8(m - \frac{1}{2})$ or $8m - 4$

Score Point 2
(Example A)



Student gives a correct expression for both parts. (Explanation is not required.)

Score Point 2
(Example B)



Student gives a correct expression for both parts.

SCORE POINT 2
(EXAMPLE C)

13

A.

$8 per hour • M hours Morgan worked

8M

B.

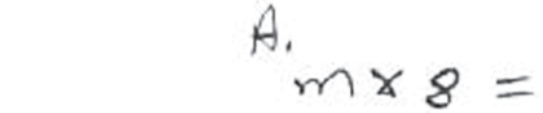
$8 per hour • (M hours Morgan worke - 1/2 hour)

8(M - 1/2)

Student gives a correct expression for both parts. (Explanation is not required.)

SCORE POINT 1
(EXAMPLE A)

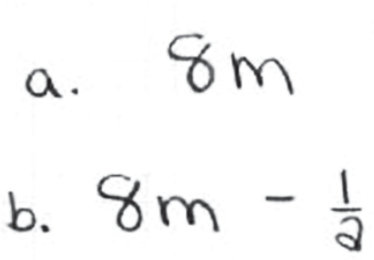
13



Student gives a correct expression for part a.

SCORE POINT 1
(EXAMPLE B)

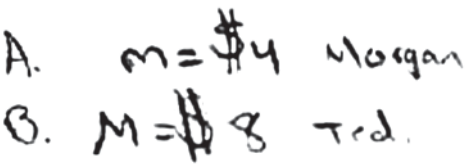
13



Student gives a correct expression for part a.

SCORE POINT 0
(EXAMPLE A)

13



Student's responses are incorrect.

DSP 7.2 **Analyzes patterns, trends, or distributions in data in a variety of contexts by solving problems using** measures of central tendency (mean, median, or mode), dispersion (range or variation), or outliers to analyze situations to determine their effect on mean, median, or mode; and evaluates the sample from which the statistics were developed (bias).

14 The table below shows scores on a mathematics placement exam reported from five different schools.

Mathematics Scores

School	Score
Bayview Middle School	35.4
Mountain Top Middle School	30.9
Sunset Middle School	26.1
Evergreen Middle School	30.3
Gateway Middle School	31.3

Based on these data, the mean school score is 30.8. An error was found in the Sunset Middle School score. The correct score is:

Sunset Middle School	Correct score: 29.6

What is the corrected mean school score? Show your work or explain how you know.

Scoring Guide

Score	Description
2	Student gives correct answer, **31.5**, with sufficient explanation or work shown to indicate strategy.
1	Student gives correct answer. OR Student's explanation or work indicates correct strategy.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Responses:

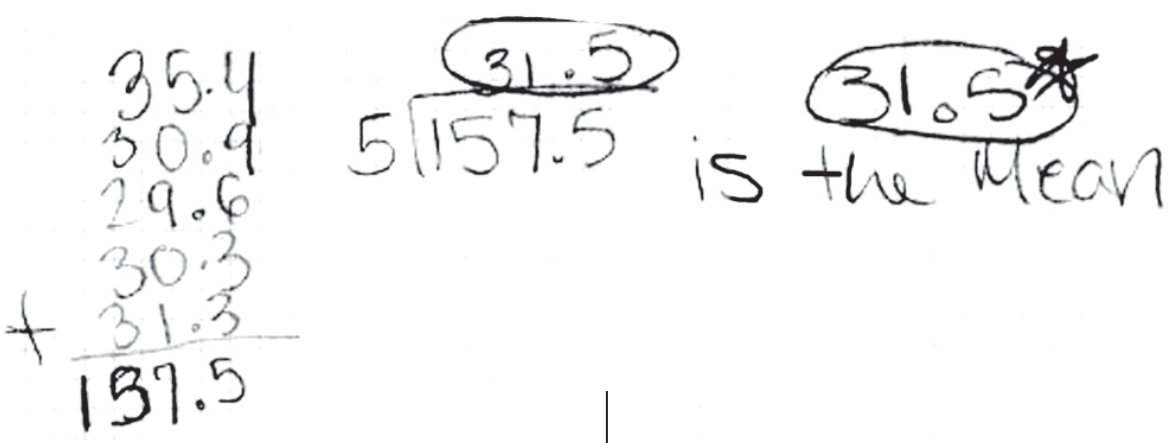
Multiply 30.8 (the original mean) by 5, subtract 26.1, then add 29.6, and divide by 5

OR

(35.4 + 30.9 + 29.6 + 30.3 + 31.3) ÷ 5 = 31.5

Score Point 2
(Example A)

14



Student's answer is correct, with sufficient work shown to indicate correct strategy.

Score Point 1
(Example A)

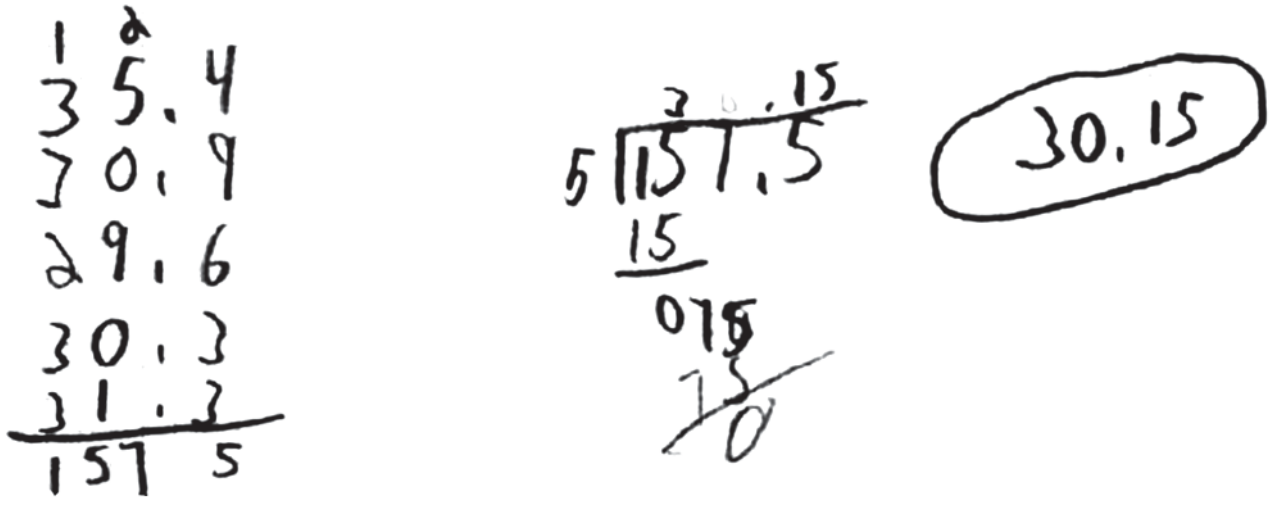
14

The correct mean is 31.5

Student's answer is correct, with no explanation or work shown.

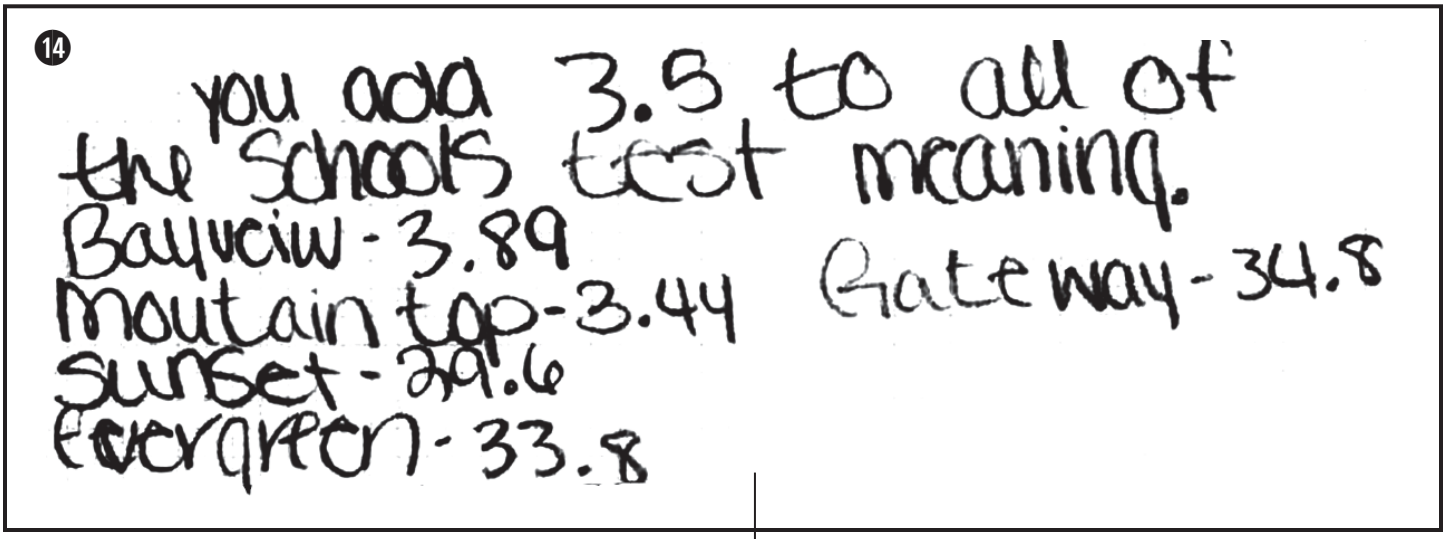
Score Point 1
(Example B)

14



Student's work indicates correct strategy with an arithmetic error.

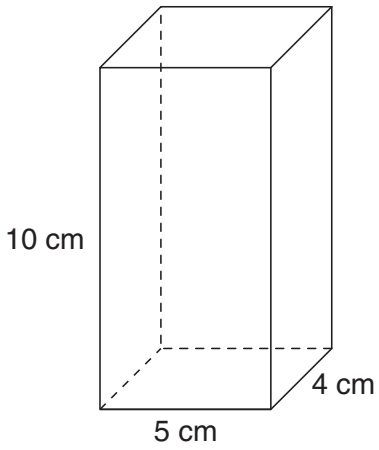
SCORE POINT 0
(EXAMPLE A)



Student's response gives no evidence of understanding the concept being measured.

G&M 7.6 **Demonstrates conceptual understanding of the area** of circles or the area or perimeter of composite figures (quadrilaterals, triangles, or parts of circles), **and the surface area of** rectangular prisms, **or volume of** rectangular prisms, triangular prisms, or cylinders using models, formulas, or by solving related problems. Expresses all measures using appropriate units.

15 This diagram shows the dimensions of a container in the shape of a rectangular prism.



a. What is the volume, in cubic centimeters, of the container? Show your work or explain how you know.

b. A different container is also a rectangular prism and has the same volume as the container in part a. This container has a square base with side lengths of 5 cm. What is the height, in centimeters, of this container? Show your work or explain how you know.

Scoring Guide

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Training Notes:

Part a: 2 points for correct answer, **200** (cm^3), with correct work shown or explanation given

OR

1 point for correct answer, with incomplete or no work shown or explanation given

or

for correct strategy with incorrect answer

Part b: 2 points for correct answer, **8** (cm) or correct answer based on incorrect answer in part a, with correct work or explanation involving 3 dimensions and addressing the change in the base dimensions

OR

1 point for correct answer, with incomplete or no work shown or explanation given

or

for correct strategy with incorrect answer

Note: Do not penalize for incorrect units in either part unless for a 4 score.

Sample Responses:

Part a: Volume = l × w × h = 5 × 4 × 10 = 200 cm^3

Part b: Volume = Area of Base × Height

Area of Base = 5^2 = 25

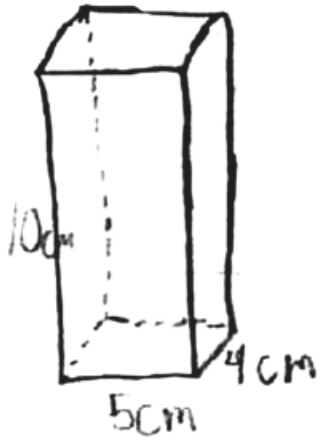
200 = 25 × Height

Height = 200 ÷ 25 = 8 cm

SCORE POINT 4
(EXAMPLE A)

15

a.)

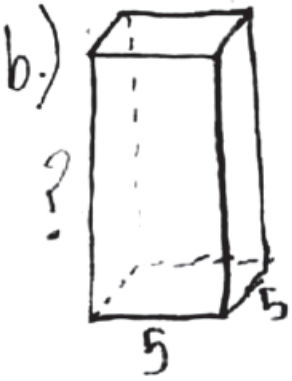


$B = bh$
$B = 5 \cdot 4$
$B = 20$

$V = Bh$
$V = 20 \cdot 10$
$V = 200\text{cm}^3$

a) Student's answer is correct, with correct work shown. (2 points)

b.)



1) $B = bh$
$B = 5 \cdot 5$
$B = 25$

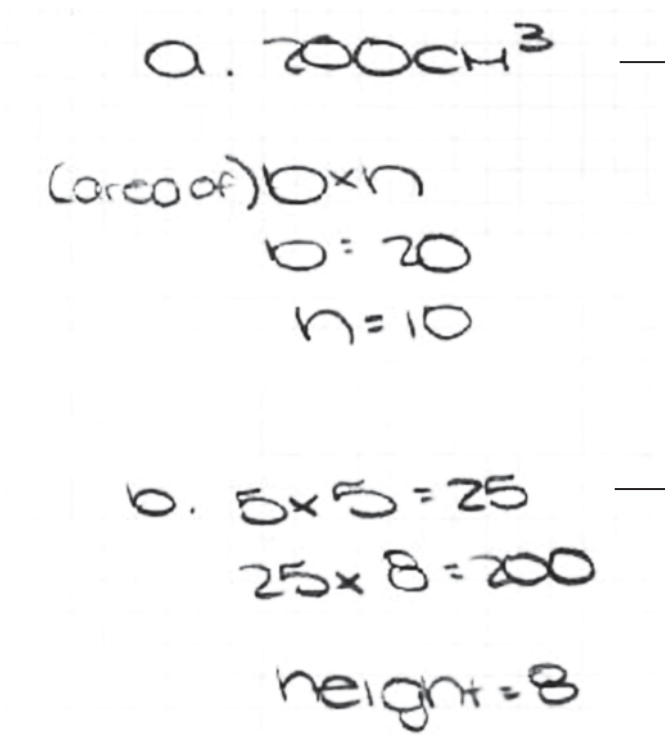
$V = Bh$
3) $V = 25 \cdot 8$
$V = 200\text{cm}^3$

$h = V \div B$
2) $h = 200 \div 25$
$h = 8$ ← answer

b) Student's answer is correct, with correct work shown. (2 points)

SCORE POINT 4
(EXAMPLE B)

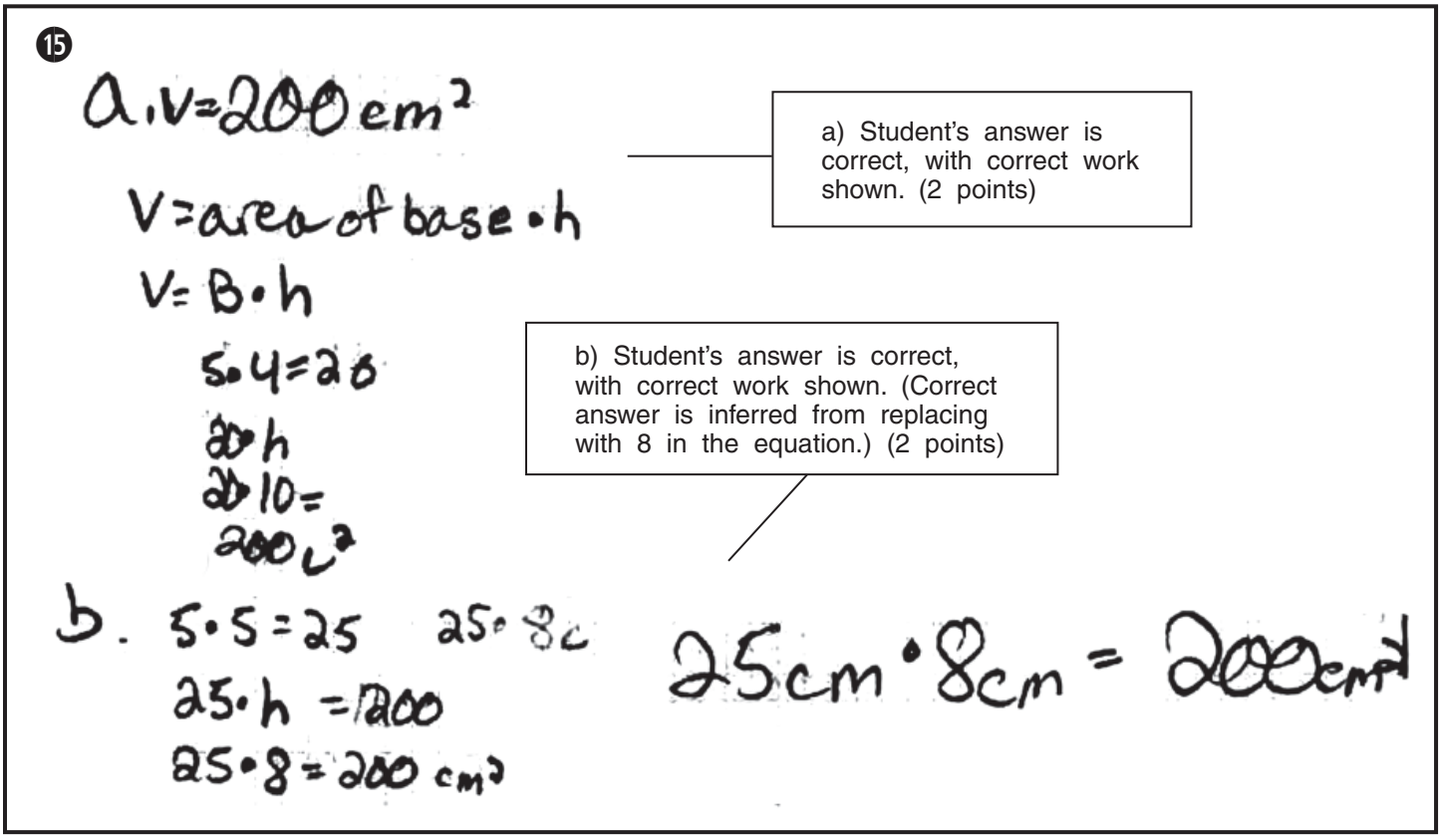
⓯



a) Student's answer is correct, with correct work shown. (2 points)

b) Student's answer is correct, with correct work shown. (2 points)

SCORE POINT 3
(EXAMPLE A)



a) Student's answer is correct, with correct work shown. (2 points)

b) Student's answer is correct, with correct work shown. (Correct answer is inferred from replacing with 8 in the equation.) (2 points)

Note: Although this response earned 4 points, it received a score of 3 due to the use of incorrect units.

SCORE POINT 3
(EXAMPLE B)

15

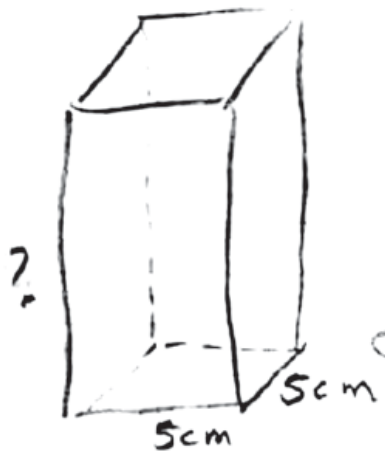
a) 208 in cubic centimeters

$V = L \times W \times h$

$4 \times 5 \times 10 = 208\text{cm}$

a) Student's answer is incorrect, but work shown indicates correct strategy. (1 point)

b)



$V = L \times W \times h = 208$

$V = 5 \times 5 \times h = 208$

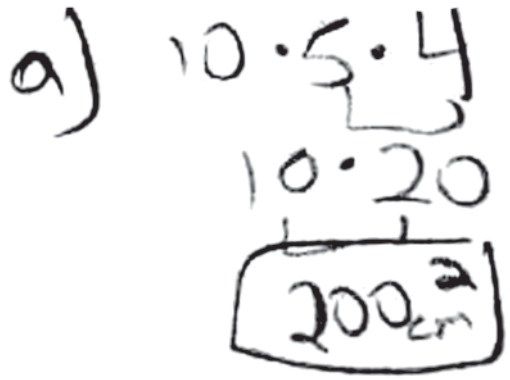
$V = \frac{25 \times h}{25} = \frac{208}{25}$

$V = 8.32\text{ cm}$

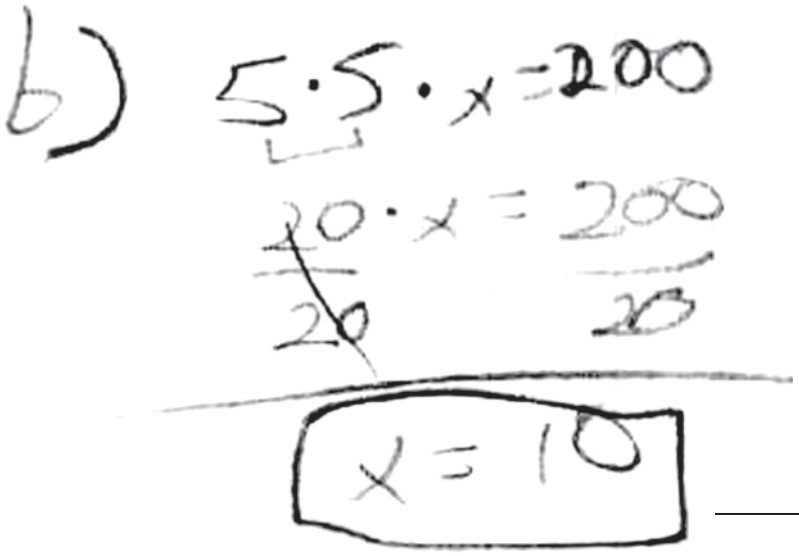
b) Student's answer is correct based on incorrect result in part a, with sufficient work shown to indicate correct strategy. (2 points)

SCORE POINT 3
(EXAMPLE C)

15



a) Student's answer is correct, with correct work shown. (2 points)



b) Student's answer is incorrect, but work shown indicates correct strategy. (1 point)

SCORE POINT 2
(EXAMPLE A)

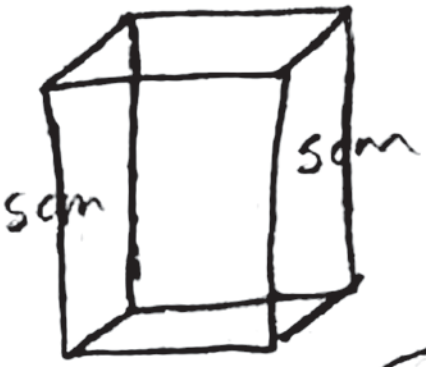
⓯

a. $10 \cdot 5 \cdot 4 = 200$

$50 \cdot 4 = 200$ cubic centimeters.

a) Student's answer is correct, with correct work shown. (2 points)

b.



40 $200 \div 5 = 40$

$40 \div 2 = 20$

20 cm

b) Student's answer is incorrect, with incorrect strategy. (0 points)

SCORE POINT 2
(EXAMPLE B)

15

a) Student's answer is correct, with no explanation given or work shown. (1 point)

b) Student's answer is correct, with no explanation given or work shown. (1 point)

SCORE POINT 1
(EXAMPLE A)

15

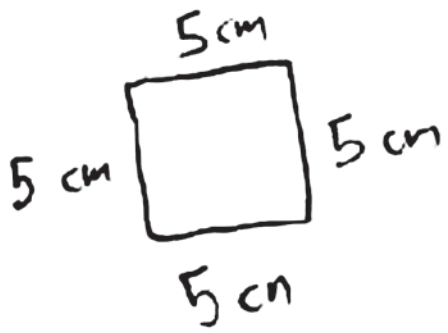
(A) 180 cm because the base is

5 cm x 4 = 18 cm then hight is 10 cm so

18 cm x 10 cm = 180 cm

a) Student's answer is incorrect, but work shown indicates correct strategy. (1 point)

(B)



5cm base / 5 cm hight

5 x 5 = 25

answer = 25

b) Student's answer is incorrect, with incomplete strategy. (0 points)

SCORE POINT 0
(EXAMPLE A)

15

A. The Volume in cubic cm is 40 because the length is 10 and the width is 4 and you do 10x4=40 to get the answer.

B. If the Volume is the same as A and the side lengths are 5 the width is 8 because 8x5=40.

Student's response shows insufficient understanding of the concepts being measured.